
U.S. TRADE AND DEVELOPMENT AGENCY



EXECUTIVE SUMMARY

Automation of Iron Ore Beneficiation Plants

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Region: Latin America
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Sector: Manufacturing

1.0 EXECUTIVE SUMMARY

1.1 Project Assignment

MSI was awarded a consulting contract by MBR to conduct an evaluation and study of its beneficiation plants, to determine whether or not upgrading the process and present control and automation system would be of benefit to MBR.

MSI's evaluation was to be based primarily upon a site visitation of the MBR installation and evaluation of data and information about the various processes and systems identified by MBR.

1.2 Site Visitation

MSI's site visitation took place during the period 17-21 July 2000. The MSI team visited the Pico Mine, Pico ITMD facility and viewed the location of the Vargem Grande plant site. MSI also met with key MBR personnel to discuss past, current and anticipated operational problems and situations.

While the Pico ITM-D plant was visited and inspected, it was not observed under normal operating conditions due to scheduled preventative maintenance work that was conducted on the day of the plant visitation.

The Pico ITM-D facility has been in operation since about 1994. The plant capacity is currently 8 million tonnes per year. Aside from expanding the initial capacity output, the original design of the circuit has been changed and modified to accommodate a spiral and scavenger flotation circuits. The facility produces the following products: lump ore, sinter and pellet fines feed.

The Vargem Grande facility is currently under construction and anticipated to start up the first phase of the project in the second quarter of 2001. It is very similar to the Pico ITM-D plant in respect to size, type of products produced, type and size of process equipment, as well as process control equipment and system.

The ITM-D facility's process instrumentation and control utilizes standard sensor elements, transmitters, process instrumentation, control loops and a PLC system for control. The system is relatively new, but not as sophisticated as the more modern DCS systems commonly used in the mineral industry.

The Vargem. Grande, process instrumentation and control, is more modern than the ITM-D system but, essentially it is designed on the same principal, the PLC process control.

1.3 Analysis of Data and Information

The Pico ITM-D facility does not appear to have any bottlenecks with respect to production capacity throughput.

The analysis of the Pico ITM-D operating and shipment data for 1999 and 2000 indicates the facility is operating at or above design expectations with respect to quantity of products, but not with respect to quality. The anticipated overall plant weight recovery of 90% has not been obtained. The weight recovery in the flotation circuit and grade are well below original design expectations.

The product quality varies greatly as do the processing variables used to control product quality.

The current process control equipment and system at Pico utilizes a PLC based system with standard sampling and analytical analysis. This system is relatively new, and judged to be effective, if a stable feed, grade and tonnage, to the facility can be provided. Better or faster analytical results would help MBR improve attaining better weight recovery, reduce reagent consumption and obtain a more consistent product quality.

The Vargem Grande plant capacity for Phase I is about 8 million tonnes per year and it is not yet in production. Based upon the design drawings and data reviewed, the facility is expected to operate at design tonnage and produce products within the expected quality range of the MBR current specifications.

While the circuit is similar to the Pico ITM-D process, a coarser ore will be processed such that lump ore will be the main product and PFF will be a relatively small component of the final product output.

The design for the process control equipment is similar to that of the Pico ITM-D. This system is expected to operate as designed.

1.4 Evaluation of Process & Control System

The Pico and Vargem Grande facilities are relatively low energy consumers and have low cost electric power rate. Some savings in power costs are anticipated to be obtained if power management systems are employed.

Both operations utilize standard transmitters in their control and instrumentation loops. Self-calibrating type transmitters would help reduce maintenance time and costs and provide better accuracy.

A faster response in monitoring and control in the flotation feed variables would help improve the metallurgy and quality as well as economics of the flotation circuit.

Process control at Pico is with a PLCsystem that is five years old. The Vargem Grande plant utilizes a more modern and faster PLC system. Both PLCs should be converted to an upgraded PLC system. The conversion to a DCS system should be considered if an "Expert" plant control system is to be eventually considered and installed. While a DCS system is not a prerequisite for installation of an "Expert" system, it will facilitate better process control if used with an "Expert" system.

1.5 Recommendations

MSI recommends that on-stream slurry analyzers be added to the flotation circuit in order to improve process control and lower costs. In addition, the PLCsystem systems should be upgraded and possibly move to a DCS system in anticipation at the possibility of eventually installing an "Expert" system. Self-calibrating transmitters are also recommended as improvements, as well as software programs to manage electric power.

MSI proposes a three option recommendation for each facility for the up-grade and modification plan for each facility. The general plan by plant for each scenario is: